ELECTROCHEMICAL OXIDATION OF ALKYLPHENOLS AT ECR-SPUTTERED CARBON FILM ELECTRODE WITH SUB- NANOMETER FLAT SURFACE

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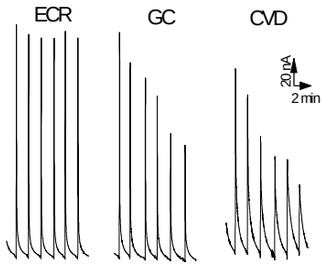
It is becoming more and more important to detect alkylphenols (APs) with a simple and effective method because APs (especially *p*–nonylphenol (NP)) have reproductive and endocrine disrupting effects to both human beings and wildlife. It is very difficult to analyze APs with electrochemical method because the electrochemical reaction is irreversible and oxidized products contaminate the electrode surface. It is necessary to find better electrode materials that cause less surface contamination.

Here, we report a new carbon film electrode prepared by the electron-cyclotron-resonance (ECR) sputtering method. A RF-bias setup for the substrate holder was introduced in conventional ECR apparatus to control ion irradiation current and ion acceleration voltage independently. Non-hydrogenated amorphous carbon film (40nm) was deposited on the oxidized silicon substrate (2 inches in diameter). And then, the ECR sputtered carbon (SC) film was cut into rectangle and was fixed by a plastic tape with a hole (d=3 or 6mm) to form a disk electrode. The Raman and XPS spectra were studied to confirm that the surface structure is different from those of diamond, GC and thermo-CVD carbon films. The observation of AFM and TEM shows the particles both on the surface and inside are less than 5nm. We examined the cyclic voltammetry for APs at ECR-SC film electrode. The comparison experiments were conducted with GC and CVD carbon electrodes. The results show that ECR-SC film electrode has wider potential range and lower background current and its surface is less easily contaminated. In flow system, the effects of hydrodynamic voltammograms (HDVs), pH and flow rate on the detection of NP were studied. Under the optimum condition, the peak current was linear in relation to the NP concentration from 0.125 μM ~ 10 μM with the detection limit of 50 nM. The reproducibility of continuous injections of NP at ECR-SC film electrode is very good compared with GC and CVD carbon electrodes. The ECR-SC film electrode has potential to utilize in analyzing in environmental samples.



The reproducibility of NP at ECR-SC, GC and CVD carbon electrodes. Detection potential, 0.9V; injection, 20 μL; buffer, 0.1 M PBS, pH7; flow rate, 0.5 mL/min.